AerospaceDaily & DEFENSE REPORT

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Inside:

Slow Recovery

Commercial aviation's novel coronavirus pandemic-driven downturn appears to have hit its low point during the second quarter, but signs point to a slow and unsteady recovery that will last through at least 2023, Raytheon Technologies Corp. executives say. The conglomerate, now one of commercial aviation's largest suppliers primarily through its Collins Aerospace and Pratt & Whitney segments, reported second-quarter revenue declines of 35% and 30%, respectively, in those units. "We are tracking air travel trends across the globe on a daily basis. And while they are generally improving, recovery is slow," CFO Anthony O'Brien says. "We now see the recovery being protracted over several years, at least through 2023."

Daily Briefs

U.S. STATE DEPT. approved $39m Foreign Military Sale to the Netherlands of 16 AIM-120C-8 Advanced Medium Range Air-to-Air Missiles and related equipment.

BOEING has A$300m ($215m), six-year Royal Australian Air Force contract to support P-8A Poseidon aircraft at RAAF Base Edinburgh, creating 40 new jobs.

GEORGIAN MINISTRY OF DEFENSE on July 24 announced restart of complete overhaul/modernization program for its **SUKHOI** Su-25 fighters, **MIL** Mi-24 attack helicopters.

VECTRUS SYSTEMS CORP. has $529m U.S. Army contract for base operations and security support services at Camp Arifjan, Kuwait.

SCD.USA INFRARED LLC has $17.4m U.S. Army contract for AN/VSQ-6B Vehicle Optics Sensor system sustainment support.

FUNDING & POLICY

Senate GOP Seeks Billions For Defense In COVID-19 Relief Bill

STEVE TRIMBLE, steve.trimble@aviationweek.com

A $306 billion proposal by Senate Republicans for the fourth legislative intervention in response to COVID-19 includes $28 billion for the Defense Department, adding funding for more Lockheed Martin F-35As and C-130Js and Boeing P-8As and AH-64Es.

The legislation proposed by Sen. Richard Shelby (R-Ala.), Appropriations Committee chairman, also creates a Defense Industrial Base Resiliency Fund with an overall total of $10.8 billion, which would be split between the four services.

A separate COVID-19 relief package passed by the House of Representatives in May includes no funding for defense procurement or industrial base resiliency, so the differences of any bill passed by the Senate must be resolved in a bicameral conference before a final version could be signed by President Donald Trump.

The proposed Senate version includes funding for as many as eight more F-35As, eight more C-130Js, seven P-8As and eight AH-64E new-build aircraft. The proposal also seeks $40.1 million to replace a DHC-8 Saturn Arch surveillance aircraft for the U.S. Army and an additional $650 million for replacement wings for the A-10 fleet.

The Republican proposals also would address several of the Missile Defense Agency's unfunded priorities in fiscal 2021, including adding about $320 million for missiles and launchers for an eight Terminal High Altitude Area Defense battery, along with an extra $65.8 million for the Regional Glide Phase Weapon System (RGPWS).

Three of the four defense oversight committees in the House and Senate have voted

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to transfer authority and funding for the Hypersonic and Ballistic Tracking Space Sensor (HBTSS) from the Space Development Agency to the Missile Defense Agency. But the COVID-19 relief proposal by the Senate would reverse the shift in authorities, while significantly increasing the budget. The Defense Department proposed to spend $108 million on HBTSS split between the SDA and MDA, but the new Republican proposal would add $290 million for HBTSS under the SDA only.

The proposal also could accelerate one weapons upgrade for the F-35. A $20 million line item in the Senate legislation would be devoted to integrating the Lockheed Martin AGM-158 Joint Air to Surface Standoff Missile on the F-35.

PROGRAMS

Draken, Tacair Win USAF Red Air Support Awards, Joining ATAC

STEVE TRIMBLE, steve.trimble@aviationweek.com

The U.S. Air Force has selected three companies to provide "red air" combat training at five bases with a mix of French- and US-built, 1960s-era fighters, Air Combat Command (ACC) confirmed July 28.

Draken International will support 800 sorties per year by the F-15E formal training unit (FTU) at Seymour Johnson Air Force Base (AFB), North Carolina, and 1,000 sorties per year for the F-16 FTU at Kelly Field, Texas, ACC told Aerospace DAILY.

Tactical Air Support (Tacair)'s F-5ATs will support 800 sorties annually for the F-15C FTU at the Kingsley Air National Guard Base, Oregon, ACC said.

Finally, Airborne Tactical Advantage Company (ATAC) will support, as announced on July 27, two bases. ATAC's ex-French Mirage F1s will support 1,558 sorties each year for the F-16 FTU at Holloman AFB, New Mexico and 1,530 sorties annually for the F-35 FTU at Luke AFB, Arizona.

"The companies will provide realistic and challenging advanced adversary air training. The air support services are expected to begin in late summer 2020 at each location," ACC said in a statement.

As the first tranche of a 10-year, $6.4 billion contracted air services program, the latest awards appeared to shut-out expected bids from Air USA and Top Aces.

Air USA and Top Aces need task orders from the Air Force to seek State Department approval to import advanced fighters. Air USA has an agreement to purchase ex-Royal Australian Air Force F/A-18s and Top Aces has an agreement to purchase F-16A/Bs.

The Air Force still plans to award contracts for private aircraft services at 17 more locations, including seven more for adversary counter-air and 10 for close air support.

First Round Of Awards For USAF Red Air Services

Company	4-Yr Award ($M)	Sorties/Yr	Aircraft	Base	Unit
ATAC	114	1,558	Mirage F1	Holloman	F-16 FTU
ATAC	127	1,530	Mirage F1	Luke	F-35 FTU
Draken	90	1,000	A-4K and A-4N	Seymour Johnson	F-15E FTU
Draken	75	530	L-159	Kelly	F-16 FTU
TACAIR	28	800	F-5AT and CF-5D	Kingsley	F-15C

*FTU=Formal Training Unit
Source: Air Combat Command

PROGRAMS

Logos To Fly Wide-Area Imaging Sensor On Navy's RQ-21 UAS

GRAHAM WARWICK, graham.warwick@aviationweek.com

Logos Technologies is to conduct proof-of-concept flight tests of a wide-area motion imagery (WAMI) sensor on the Insitu RQ-21A Blackjack small tactical unmanned aircraft system operated by the U.S. Navy and Marine Corps.

The company has received a $6.7 million contract from U.S. Naval Air Systems Command (NAVAIR) to develop the sensor system, called Cardcounter. The system will be a missionized version of Logos' BlackKite prototype ultralight WAMI sensor.

BlackKite, in turn, is the infrared version of the RedKite-I sensor available and flown on Insitu's Integrator commercial unmanned aircraft system (UAS), from which the RQ-21 was developed. The family of WAMI sensors all descend from Logos' RedKite pod, which has flown on helicopters, fixed-wing aircraft and the Navmar RQ-23 Tigershark UAS.

BlackKite weighs less than 28 lb. and can image an area of more than 12 km² (about 5 mi.²). The system images and records the entire area in real time and streams multiple video

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PROGRAMS

Future European Fighter Program Merger Unlikely, Dassault CEO Says

TONY OSBORNE, tony.osborne@aviationweek.com

Dassault Aviation CEO Eric Trappier says he does not believe there will ever be a merger of Europe's two future combat air systems, despite calls from partners at Airbus for such a combination.

Speaking at the company's annual press conference on July 23 in Paris, Trappier said that bringing together the Franco-German, Spanish Future Combat Air System (FCAS) with the UK-led Tempest would require a "reset to zero" for both programs, setting them "back two years."

His statements are in opposition to those of Dassault's FCAS counterpart, Airbus Defense and Space. Its CEO, Dirk Hoke, repeated his call in June to merge both European programs in a bid to not repeat past mistakes. He also said parallel projects could result in skills that might be lost for years or even decades.

Trappier says the FCAS program, which sees Dassault leading on the development of the Next Generation Fighter (NGF), is "progressing nicely." But he warned governments and industrial partners not to consider bringing more nations into the FCAS fold, suggesting that such a move would create program delays.

"If we change partners every six months, I can tell you we will not reach 2040," Trappier said. It was complicated enough "to get [Spain] to joint up halfway through, but it was feasible."

Trappier said the program was existential for combat aircraft development in Europe, and without it "we would all have F-35s in 20 years' time."

Meanwhile, Spanish defense electronics firm Indra has signed up as a contractor to the FCAS Joint Concept Study with Dassault and Airbus, the company announced July 28.

Indra was selected as the Spanish national coordinator for FCAS in September 2019. The company will lead Spanish efforts in four of the eight pillars on which the program is structured. Those four are the joint pillar for coordinating the other pillars, sensors, the combat cloud network and the development of a simulation laboratory, SIMLAB, with the Spanish Air Force.

"Indra, as national coordinator, will represent the interests of the entire national industry, respecting the independence of the various companies participating in the project and strengthening its position with regard to companies from the other participating countries," the company said in a press release.

OPERATIONS

Luxembourg To Increase MMU Flight Hours

TONY OSBORNE, tony.osborne@aviationweek.com

Luxembourg looks set to expand its role in the European Multinational Multi-Role Tanker Transport Unit (MMU) by enabling the purchase of a ninth Airbus A330 Multi-Role Tanker-Transport (MRTT).

The country's lawmakers have voted in favor of increasing the country's annual contribution from its current 200 hr. to 1,200 hr., paving the way for an additional aircraft.

One third of Luxembourg's hours would be made available for other nations in the MMU to use, a July report to lawmakers states. That move helps to compensate for the fact that Luxembourg, being a small country, lacks the personnel needed to staff the commitment.

"Luxembourg will benefit from significantly increased visibility by strengthening a program and filling a strategic capacity gap recognized by both NATO and the European Union," the report said.

Increasing the flight hours to 1,200 hr. will result in an the average annual operating cost amounting to €11.3 million ($13.3 million), the report said. Costs are not to exceed €598.4 million over 30 years.

The decision comes just two weeks after the delivery of the first A330 MRTT to the main MMU operating base at Eindhoven in the Netherlands. First aerial refueling training flights are due to begin early next month, while the second MMU aircraft is expected to arrive imminently. The aircraft are configured for in-flight refueling missions, as well as the transport of passengers and cargo, and medical evacuation operations.

Luxembourg was one of the lead nations, along with the Netherlands, in setting up the MMU. They were joined subsequently by Belgium, the Czech Republic, Germany and Norway.

By purchasing hours rather than platforms, small countries normally unable to afford a tanker can still get access to one.

The fleet will primarily operate from Eindhoven and from a forward operating base at Cologne, Germany.

European defense materiel agency OCCAR is managing the MMF acquisition phase and the first two years of the Initial In-Service-Support on behalf of the NATO Support and Procurement Agency (NSPA). Following the acquisition phase, NSPA will be responsible for the complete life-cycle management of the fleet.

PROGRAMS

Virgin Galactic Unveils SpaceShipTwo Cabin

IRENE KLOTZ, irene.klotz@aviationweek.com

With commercial flights aboard the suborbital SpaceShipTwo vehicle approaching, Virgin Galactic on July 28 unveiled the ship's cabin.

The sleek, mimimalistic design is intended to blend safety for six passengers with maximizing the novel view of Earth from the edge of space and the ability to experience a few minutes of weightlessness unstrapped from seats.

The six seats are attached to the vehicle's sidewalls, leaving the floor space open. They are set up in three rows, with one seat along each side of the cabin, which is 7.5 ft. (2.3 m) in diameter. The passenger section is set slightly below the cockpit, which will be occupied by two Virgin Galactic pilots.

The seats, made of aluminum and carbon fiber, have variable-height backs that can be configured to accommodate a wide variety of body shapes and sizes, from petite, 100-lb. grandmothers to beefy, 300-lb. football players, Virgin Galactic's Chief Space Officer George Whitesides told Aerospace DAILY ahead of the cabin unveiling, held virtually on YouTube due to the novel coronavirus pandemic.

Whitesides, previously the company's CEO, turned over that role on July 20 to former Disney executive Michael Colglazier, who is charged with building the Virgin Galactic spaceflight experience into a multibillion-dollar commercial operation.

"You have to build from safety to comfort to experience," Whitesides said. "The seat, for example, has to sustain a certain amount of G's, with a certain amount of loads, and you connect that load into [the] cabin wall and do all that in a safe way.

"They have a really elegant design," he continued. "It doesn't translate straight down, it translates sideways into the sidewall, which is a clever way to keep the cabin relatively free and flexible because once you go into space there is no 'floor' anymore. You'll have this entire volume to play in. We tried to create a basic structural system that minimized the amount of volume that the seats had to maintain in the cabin and the best way to do that was to attach the seats to the cabin wall itself."

The incline of seats will be automatically adjusted by the pilots to maximize safety and enhance the experience during the various phases of flight, from boost, to coast up to apogee more than 50 mi. above the planet's surface, and then atmospheric reentry and landing.

"Between safety and comfort are a whole bunch of other design metrics, such as how the seat wraps around you a little bit, from your head to your shoulders and down to your torso," Whitesides said. "We're going to tailor the seats because in general with transportation seating you have one-size-fits-all and that is not optimal when you really look at the variability of the human form. To actually accommodate those shapes, volumes and weights is tricky to do in a way that makes them all comfortable."

To enhance the experience of flying beyond the atmosphere, Virgin Galactic chose a neutral palette for the interior so as not to detract from the views of Earth. "I think it's a graceful and elegant selection of material colors. We didn't want bright hues all over the place that distract from your experience of looking out," Whitesides said.

Each seat is positioned next to side and overhead windows that are wrapped in soft handgrips to help passengers navigate during the microgravity part of the flight.

Passengers will be able to unclip their five-point harness with a single release mechanism to experience weightlessness, if they so choose. The seat backs, likewise, are dressed in materials, designed by spacesuit manufacturer Under Armour, to serve as handholds to help passengers move around the cabin.

The interior also includes a palette of lighting options, which will be autonomously controlled throughout the phases of flight, including a dark cabin to enhance the views of Earth and space. At the rear of the cabin is a large, round mirror for self-viewing during the weightless portion of flight. In addition, 16 cameras will be rolling to provide passengers with photos and video footage.

Virgin Galactic is preparing for its first powered flight since the spaceship, known as VSS Unity, has been relocated from its manufacturing and primary test facilities at the Mojave Air and Space Port in California to its operational base near Las Cruces, New Mexico.

If the powered flight test goes as planned, the company intends to conduct a short series of flights with four Virgin Galactic employees flying in the passenger cabin for additional assessments prior to the start of commercial service.

"We'll let the engineers dictate the schedule, but we're getting pretty close now," Whitesides said.

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"chip-outs" to handheld devices on the ground.

The Cardcounter sensor will use the BlackKite's high-performance, multi-mode processor to store 6 hr. or more of mission data, Logos said. The NAVAIR contract covers development of two Cardcounter prototypes, with planned delivery by the end of September 2020 for flight testing on the RQ-21A Blackjack.

Staff

EDITORIAL
2121 K Street, NW, Suite 210, Washington, DC 20037
+1-202-517-1100 awin.aviationweek.com

EDITORIAL STAFF
Editor In Chief Jefferson Morris
Assistant Editor Andy Savoie
Editorial Director Joseph C. Anselmo
Military Reporters Michael Bruno, Bill Carey, Jen DiMascio, Lee Hudson, Guy Norris, Tony Osborne, Bradley Perrett, Steve Trimble, Graham Warwick
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P.O. Box 1175, Skokie, IL 60076-8175
Tel: +1-866-857-0148, Intl. +1-847-763-9147
Fax: +1-844-609-4274, awin@omeda.com

INTELLIGENCE AND DATA SERVICES
Managing Director Anne McMahon
Tel: +1-646-291-6353, anne.mcmahon@aviationweek.com
Senior Director, Business Development Thom Clayton
Tel: +44 (0) 20 7017 6106, thom.clayton@aviationweek.com

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User Engagement Laurie Grossman
Tel: +1-646-233-4434, laurie.grossman@aviationweek.com
Online access to Aerospace Daily & Defense Report is available at awin.aviationweek.com

ADVERTISING
Sales Director Melissa Crum
Tel: 913-284-2951, melissa.crum@informa.com

REPRINTS
Wright's Media
Tel: 1-877-652-5295 (within U.S.)
Tel: 1-281-419-5725 (outside U.S.)
informa@wrightsmedia.com

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PROGRAMS

Tempest Should Be A UCAV, Think Tank Suggests

TONY OSBORNE, tony.osborne@aviationweek.com

LONDON—Britain's combat aircraft ambitions for the 2030s and 2040s are not compatible with the nation's finances unless the UK considers developing the Tempest future combat air system as an unmanned combat air vehicle (UCAV), a think tank has suggested.

"Explicitly designating Tempest as a UCAV could help avoid this deadlock," Justin Bronk, Fellow for Airpower and Technology at the Royal United Services Institute, writes in a report on the UK's Combat Air Choices published July 28.

"Without greatly increased defense spending, F-35 purchases at scale beyond 2024 remain financially incompatible with a separate piloted Tempest program to replace [the Eurofighter] Typhoon," Bronk says, noting that the UK will be unlikely to be able to afford the full complement of 138 F-35s it signed up for in the 2015 Strategic Defense and Security Review.

Although it has committed to 138 F-35s, the UK defense ministry has so far only budgeted for 48 F-35B short takeoff and vertical landing versions to support the UK's two new aircraft carriers.

Instead, Bronk suggests the UK should buy as many F-35s as it can reasonably afford, but switch to purchasing the conventional F-35A model once the UK's carrier-enabled power projection requirements are met, requiring the 48 F-35Bs. But Bronk notes that buying additional F-35s may have to be partly funded by cuts to air mobility and intelligence, surveillance and reconnaissance fleets.

Tempest origins

The UK launched its Tempest initiative two years ago to pave the way for a replacement for the Eurofighter from 2035. An industry consortium, Team Tempest is supporting the Future Combat Air System Technology Initiative (FCAS TI) to develop and mature associated technologies and production processes to support the development of a low-cost, affordable and upgradable combat aircraft that Royal Air Force senior officers have said should be optionally manned.

By designating the Tempest as a UCAV, the RAF would cut out the complexity of training, testing and certification requirements for a piloted or optionally piloted air vehicle, Bronk suggests.

"A UCAV-centric Tempest program could generate a meaningful frontline combat mass approaching that of the Typhoon force by 2040," and "with no pilot training and currency flying hour requirements, a slowly growing and shadowy UCAV force would also be much cheaper to maintain combat-ready per airframe in service," Bronk argues.

For industry, developing Tempest as a UCAV would generate new intellectual property and be cheaper to develop, procure and sustain, the article argues.

Tempest does have its roots in a UCAV joint development with France that would have produced a demonstrator around 2025. But the initiative broke down after France and Germany announced their intention to jointly develop a manned Future Combat Air System together.

PROGRAMS

F-X Likely To Be Developed By MHI With U.S. Help, Reports Say

BRADLEY PERRETT, perrett@aviationweek.com

BEIJING—Japan will likely engage Mitsubishi Heavy Industries (MHI) to undertake the F-X fighter program as prime contractor, with help from a U.S. company, local media reports suggest.

Cooperation with Britain will be limited to possible sharing of engine parts, according to the Mainichi newspaper.

MHI has the great bulk of Japanese experience in fighter development, though Kawasaki Heavy Industries (KHI) and Subaru have contributed to earlier programs.

Mainichi explicitly said MHI will be the prime contractor, with engine maker IHI working as a subcontractor. A partner company will be chosen from among Boeing, Lockheed Martin and Northrop Grumman, it added.

There will be one prime contractor, the Jiji news agency and Nikkei newspaper said. Jiji, citing sources in the government and the ruling Liberal Democratic Party (LDP), said this was most likely to be MHI. Nikkei said MHI is likely to be the single contractor because it is the largest Japanese airframe company.

The F-X (as it has most recently been called by the defense ministry) will be a large fighter replacing the MHI F-2 beginning around 2035. The prospective production run is similar to that of the F-2, of which 94 units were built. According to Nikkei, a program with a production run of about 90 F-Xs may cost ¥5 trillion ($46 billion).

The F-X formerly was called the Future Fighter and the Next Generation Fighter.

Japan also has considered British companies to assist in development, especially because the F-X could share systems and technology with the Tempest, a program for a fighter for the Royal Air Force with a timescale similar to Japan's. But the Mainichi said discussions with Britain would continue on the basis of sharing engine parts. This must mean possible Rolls-Royce support to IHI.

BAE has been a candidate to help with the airframe and overall integration.

The defense ministry told LDP members this month that it proposed to begin concept design next year and start building the first F-X prototype in 2024; this suggested a launch of full-scale development in 2022.

In the same briefing, the ministry said it had four alternatives for organizing the program: separate prime contracts for the airframe, electronics and propulsion, as with the F-2; a joint venture or consortium taking on the whole program; a special-purpose company doing so; or just one company doing so (the arrangement that is now reported to have been chosen).

MHI developed the X-2 fighter-technology demonstrator as the sole prime contractor.

PROGRAMS

Virgin Orbit Tracks Launch Failure To Broken LOX Line

IRENE KLOTZ, irene.klotz@aviationweek.com

The failure of a high-pressure liquid-oxygen feed line triggered a premature engine shutdown during the debut flight of Virgin Orbit's LauncherOne rocket, the company said July 27.

The long-awaited LauncherOne demonstration flight was "a day of extreme joy … and a bit of disappointment, which in this business often happens on first flights," CEO Dan Hart said during a July 22 webinar hosted by the Space Generation Advisory Council and first reported by Spaceflight Now.

Initially, the two-stage booster performed as planned, dropping cleanly from the company's converted Boeing 747 carrier aircraft on May 25, marking the first air-launch attempt of a liquid-fueled orbital launch vehicle.

The vehicle's Newton 3 first-stage liquid oxygen/RP-1 rocket ignited as planned 5 sec. after release. "It started lifting up its nose, pulled up pitch and traveled along our trajectory to target the orbit, so we were pretty stoked at that point that we had at that moment proven all of the new aspects of air launch," Hart said.

The Newton 3, which had never previously been ignited in flight, is designed to push LauncherOne to a speed of around 8,000 mph after a burn lasting just less than 3 min.

Following main engine cutoff and stage separation, the smaller Newton 4 upper-stage was then to continue accelerating a test payload into a polar orbit.

LauncherOne's flight, however, did not last long.

A few seconds after main-engine ignition "unfortunately, and to our disappointment, we had a component break in our engine system. It was a high-pressure feed line, so LOX (liquid oxygen) stopped going into the engine and our flight was terminated," Hart said.

"We left both incredibly excited, incredibly thrilled and a bit disappointed that we didn't get into orbit," he added. "We've identified what we need to fix."

The next LauncherOne is in final integration and scheduled to leave its Long Beach, California, manufacturing facility in the

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OPERATIONS

Demo-2 Ready For Splashdown; Future Commercial Crew Named

MARK CARREAU, mark.carreau@gmail.com

HOUSTON—NASA Demo-2 astronauts Bob Behnken and Doug Hurley took a look back and a look ahead during July 28 interviews aboard the International Space Station (ISS), just days before their two-month Commercial Crew Program/SpaceX test flight is scheduled to end.

If the weather cooperates, Behnken and Hurley will climb aboard the Dragon capsule in which they launched and docked to the ISS on May 30/31 and undock on Aug. 1 at 7:34 p.m. EDT, check out their spacecraft and carry out the orbital maneuvers required for a parachute-assisted descent and splashdown on Aug. 2 at 2:42 p.m. EDT.

NASA and SpaceX plan a July 29 Return to Earth Flight Readiness Review to assess the weather and landing site options in the waters off the Atlantic and Gulf of Mexico sides of the Florida peninsula.

The last time NASA astronauts returned to Earth with a splashdown was at the end of the July 1975 Apollo-Soyuz mission that joined three astronauts and two Soviet cosmonauts in Earth orbit. Apollo astronauts Tom Stafford, Vance Brand and Deke Slayton splashed down in the Pacific Ocean west of Hawaii.

The Demo-2 return will mark the conclusion of the first orbital spaceflight launched from the U.S. since NASA's final space shuttle flight in July 2011. Demo-2 has pioneered a new concept for commercial spaceflight that NASA hopes to extend across low Earth orbit so the agency can turn its human exploration focus to the Moon, and then Mars.

"One of the things that Doug and I would really like everyone to take away from our experience here is that if you do work really hard, you can accomplish great things," Behnken told Discovery.com in a shared interview.

"It was not a short road," he said of the decade-long initiative that faced budgetary and technical obstacles.

"It did [take] NASA and SpaceX, the partnership as a whole, time to figure out how to work together, how to accomplish the mission, what we have done," he elaborated. "That involved a NASA flight control team, a SpaceX flight control team, a SpaceX launch control team, all cooperating together. We would like to share that message."

NASA's Commercial Crew Program initiative is also working with Boeing to ensure redundancy. Boeing and NASA are currently addressing the software issues that cut short an uncrewed test flight of the CST-100 Starliner to the ISS last December and plan to repeat that flight and carry out a crew test flight to the ISS.

Current station commander Chris Cassidy of NASA, who arrived at the ISS with Russian cosmonauts Anatoly Ivanishin and Ivan Vagner in April for a six-month stay, praised Behnken and Hurley for their hard work during a mission that initially was anticipated to last perhaps no more than a couple of weeks.

Cassidy and Behnken carried out four spacewalks to wrap up a 3 1/2-year effort to replace 48 aging nickel hydrogen (NH) batteries spread along the orbiting science lab's 360-ft.-long solar power truss with 24 more efficient lithium ion (Li) units.

They carried out the final exchange of six Li for 12 NH batteries on the far starboard truss. Each logged a 10th career spacewalk, tying them for the U.S. record with retired astronauts Peggy Whitson and Mike Lopez-Alegria.

"Everything went great once we got here," Hurley said. "We hit the ground running and got very busy very quickly. We settled right in and started to get to work."

Crew-2

As Behnken and Hurley commented on their upcoming return to Earth, NASA and its European and Japanese ISS partners announced the selection of four crewmembers assigned to launch on the second SpaceX Crew Dragon, or Crew-2 mission, potentially in the spring of 2021. This will be the next mission after Crew-1, expected no earlier than September of this year.

Veteran NASA astronauts Shane Kimbrough and Megan McArthur will serve as commander and pilot for the launch and descent of the SpaceX capsule, flying with the European Space Agency's Thomas Pesquet and Japan Aerospace Exploration Agency's Akihiko Hoshide, each also a veteran of previous ISS missions.

The quartet is preparing to spend six months living and working aboard the ISS, joined by at least two Russian cosmonauts,

The Crew-2 flight plan is contingent on the successful return to Earth of Demo-2 and NASA Commercial Crew Program certification of the Crew Dragon for the regularly scheduled launches of astronauts to and from the ISS.

The Crew-1 mission will transport NASA's Michael Hopkins, Victor Glover and Shannon Watkins as well as JAXA's Soichi Noguchi.

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next few weeks to begin launch processing "while we make some modifications to the engine to strengthen up those parts," Hart said. Launch is targeted before year's end.

The accident investigation remains underway, with additional details expected to be released soon, spokesman Kendall Russell said.

PROGRAMS

Dufour Completes Initial Demo Flights For Tilt-Wing eVTOL

GRAHAM WARWICK, graham.warwick@aviationweek.com

Switzerland's Dufour Aerospace has completed 550 flights of a large-scale technology demonstrator in an initial phase of testing for its tilt-wing electric vertical-takeoff-and-landing air taxi.

Testing of the unmanned aircraft focused on expanding the flight envelope and demonstrating stability and control, including transitions between vertical and forward flight. Performance and stability exceeded expectations, Chief Technology Officer Jasmine Kent said in a statement.

Scaling is critical in the design of vertical-takeoff-and-landing aircraft and the demonstrator is large enough to have the same Reynolds numbers—an aerodynamic scaling factor—as the manned aircraft, and can therefore proof the aerodynamic data, co-founder and CEO Thomas Pfammatter told Aerospace DAILY.

The demonstrator is about the size of the Heavyside single-seat tilt-prop electric-vertical-takeoff-and-landing (eVTOL) aircraft now being flight tested by Kitty Hawk, Pfammatter said. A large enough scale to have similar Reynolds numbers is necessary to develop the flight control system for a manned version.

"With lower-scale aircraft you can just power out your physical deficiencies," he said. This scaling phenomena can lead inexperienced eVTOL developers to overestimate the performance of their designs based on flight testing of small-scale models with unrepresentatively high power-to-weight ratios.

Pfammatter said the initial phase of flights validated the transition behavior and included tests in strong winds from all directions. "We have developed the technology in both areas—electric propulsion and VTOL control system—such that we can build now our first pre-series aircraft," he said.

Dufour has previously released the aEro2 concept for a two-seat eVTOL with intercity range. This has two propellers with dual-redundant electric motors on the tilting wing. The demonstrator has four propellers on the wing. The design includes a tail fan for flight control in the hover.

Based in Visp, Switzerland, Dufour's next will aircraft be a unmanned "V2" version of its aEro 1 electric aerobatic aircraft. "[We are also] building a manned eVTOL at the size of Joby/Beta," Pfammatter said, referring to larger vehicles now being flight tested in the U.S. by Joby Aviation and Beta Technologies.